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**Automobile Insurance Losses
Personal Injury Protection and Collision Coverages**

**RELATIONSHIPS BETWEEN INJURY AND COLLISION LOSSES
AND ENGINE OPTIONS FOR SELECTED
1977-1979 COMPACT CARS**

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Summary

This Highway Loss Data Institute report summarizes the injury and collision* coverage loss experience of a group of selected 1977 through 1979 compact cars in relation to their engine sizes.

Principal Findings

- For the specialty models there were pronounced relationships between their *collision* coverage loss experience and the size of their engines. The cars with the most powerful engines had the worst loss experience.
- For the specialty models there were no consistent relationships between their *injury* loss experience and the size of their engines.
- For the regular two- and four-door models there were no consistent relationships between their loss experience – either injury or collision – and the size of their engines.
- There were consistent differences between the loss experience – both injury and collision – for corresponding two- and four-door models. In virtually every case the results for the two-door models were worse than the results for the corresponding four-door models with the same engine.

*In this report, the term *collision* refers to the particular type of insurance sold as "Collision" coverage.

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Introduction

The Highway Loss Data Institute (HLDI) is a non-profit public service organization, that gathers, analyzes, and publishes insurance data concerned with the human and economic losses associated with motor vehicle use, and especially with the ways such losses vary among different kinds of vehicles.

In 1976 HLDI published a report on the relationships between insurance losses and engine specifications that was based on the collision coverage experience of 1973 models. It concluded that, in general, within a particular vehicle series the cars with the most powerful engine options had the worst collision coverage loss experience. Since that time, however, automobile manufacturers have de-emphasized engine power and focused instead on fuel economy in their marketing of passenger cars. This report analyzes the loss experience of a group of large-selling recent model year compact passenger cars in relation to their engine options to determine whether or not they exhibit relationships between engine size and loss experience.

The particular cars studied were the 1977-1979 models of the two- and four-door Chevrolet Malibu, two-door Oldsmobile Cutlass, two- and four-door Ford Granada, two- and four-door Ford Fairmont, two- and four-door Plymouth Volare, Chevrolet Monte Carlo, Chevrolet Camaro, and Pontiac Firebird. These particular cars were chosen for a number of reasons: they were all relatively large-selling automobiles and as such generated large amounts of exposure; they included cars from the three major domestic manufacturers; and they comprised a mixture of regular two-door, regular four-door, and specialty models. The study was limited to compact models because they are the smallest cars for which a number of engine options are generally available, and in addition they represent a growing segment of the passenger car market as more and more cars are down-sized. Other larger cars, such as intermediates, which also have a number of engine options available are rapidly disappearing from the new car market place and, consequently, their experience is not included in this report.

The results in this study were based on personal injury protection and collision coverage and loss data supplied by 10 insurers: Aetna, Allstate, GEICO, Kemper, Liberty Mutual, Nationwide, Prudential, State Farm, Travelers, and USAA.

A description of the sources and nature of the data used in this report is presented in Appendix A. The data analysis methods used are detailed in Appendix B, and definitions are provided in Appendix C.

It is intended that the dissemination of this and other HLDI reports will lead to research into ways of reducing vehicle-related damage to people and property, and also provide the public with information relating to the differences in the crash damage produced by different kinds of vehicles.

Results And Discussion

This report is based on the injury and collision coverage loss experience of twelve popular compact cars – five regular two-door models, four regular four-door models, and three specialty models. It summarizes the loss experience associated with each of the popular engine options sold with these cars.

Injury results are presented for 1977-1979 models and collision coverage results for 1978 and 1979 models.

Injury Results – Specialty Models

Specialty models, much more so than regular two-door and four-door models, have available a wide range of engine options, including particularly large and powerful engines. For example, cars such as the Pontiac Firebird can still be obtained with a 400 cubic inch V-8 engine with over 200 horsepower. When these cars are equipped with such powerful engines, the resulting power to weight ratios are very high and top speed capabilities are substantially higher than 100 mph. Engines as large as the 400 cubic inch V-8, available in a car like the Pontiac Firebird, are considerably larger than the largest engines available among regular two-door and four-door domestic compacts, which for cars like the Chevrolet Malibu and Oldsmobile Cutlass have displacements of about 300 cubic inches.

Table 1 shows the injury loss experience for the three specialty models for each of the popular engine options*. The results are presented as overall injury claim frequencies, claim frequencies for injuries with medical costs greater than \$250, frequencies for injury costs greater than \$500, and frequencies for injury costs greater than \$1,000. The following exposure thresholds were used for reporting results – for the overall claim frequency results, a minimum of 5,000 insured vehicle years was required before any individual result was published; for the greater than \$250 results, 10,000 years of exposure; for the greater than \$500 results, 15,000 years of exposure; and for the greater than \$1,000 results, 25,000 insured vehicle years of exposure.

As can be seen from Table 1, the actual frequencies of injury claims exceeding \$250 was approximately one-third of the overall frequency, the frequency of claims exceeding \$500 was about one-fourth of the overall frequency, and the frequency of claims exceeding \$1,000 was about one-sixth of the overall frequency. It should be noted, however, that the total dollars paid out were dramatically influenced by the most expensive injury claims. Claims exceeding \$500, while representing only one-fourth of all the claims, account for over 85 percent of the total dollars paid out. Similarly, claims exceeding \$1,000, although representing only one-sixth of all claims accounted for approximately 75 percent of the total dollars paid out.

It is apparent from Table 1 that there were no pronounced relationships between the injury claim frequency results and the various engine options for these specialty models. Among the cars whose loss experience was examined, there was no tendency for the larger and more powerful engines to be associated with more frequent or more severe injury claims.

*The injury results shown in Tables 1 & 2 were standardized to remove effects due to differences in the mix of operator age group among different cars and engine options. Subsequent collision coverage results were similarly standardized to remove effects due to differences in both operator age group and deductible amount. The standardization procedure is described in detail in Appendix B.

Injury Results – Regular Two- and Four-Door Models

Table 2 shows the claim frequency results for the nine compact regular two- and four-door models. As with the results for the specialty models, there was again no evidence that the various engine options were associated with either higher or lower injury claim frequencies.

Four-door models, however, in most instances, had lower injury claim frequencies than the corresponding two-door models. For example, the Ford Granada two-door model sold with 250 cubic inch L-6 engine had higher injury claim frequency results in every claim size category than the equivalent four-door model with the same engine.

Collision Coverage Results – Specialty Models

Tables 3 and 4 show the collision coverage results for the 1978 and 1979 specialty models. Unlike the injury coverage results, for these cars there were very pronounced relationships between the collision coverage results and the size of the engines. For example, the Chevrolet Camaro with the 250 cubic inch L-6 engine, the smallest and least powerful engine for that car, had an average loss payment per insured vehicle year of \$109 for the 1978 models and \$110 for the 1979 models. These results were substantially lower than the results from the same car with the 350 cubic inch V-8 engine, the most powerful engine for that car. Models with the latter engine had an average loss payment per insured vehicle year of \$150 for the 1978 models and \$169 for the 1979 models, \$41 and \$59 higher than the corresponding results for the cars with the smallest engine.

In the case of the Pontiac Firebird, the range of results between cars equipped with the smallest and largest engines was even larger. The car with the smallest engine – a 231 cubic inch V-6 – had average loss payments per insured vehicle year of \$100 and \$116 for the 1978 and 1979 models respectively, compared with corresponding results of \$190 and \$194 for the cars with the 400/403 cubic inch V-8 engines. The greater loss experience among these specialty models associated with the larger and more powerful engines was found in both the claim frequency and average loss payment amount results. In general, in both model years the cars with the smallest engines had the lowest collision claim frequencies and average loss payments.

Collision Coverage Results – Regular Two- and Four-door Models

Tables 5 and 6 show the collision coverage results for the regular two- and four-door compact models studied. Unlike the specialty models, this group of cars exhibited no consistent relationships between engine size and collision coverage loss experience. There were, however, consistent differences between the corresponding two- and four-door models. In virtually every case the collision results for the two-door models were worse than the results for the corresponding four-door models with the same engine.

TABLE 1
PERSONAL INJURY PROTECTION COVERAGES
CLAIM FREQUENCY RESULTS BY ENGINE OPTION
SELECTED 1977-1979 COMPACT SPECIALTY MODELS

Make and Series	No. of Cylinders	Engine Option Displacement	Exposure (Insured Vehicle Years)	Claim Frequencies by Size of Claim (per 1,000 Insured Vehicle Years)			
				All	>\$250	>\$500	>\$1,000
Chevrolet Monte Carlo	6	200 cu. in.	5,438	25.8			
	6	231 cu. in.	23,788	20.3	7.2	5.4	
	8	267 cu. in.	21,763	19.3	8.1	5.4	
	8	305 cu. in.	80,355	20.0	8.1	5.5	3.4
Chevrolet Camaro	6	250 cu. in.	24,587	18.9	7.6	5.4	
	8	305 cu. in.	94,388	19.5	7.8	5.2	3.1
	8	350 cu. in.	44,713	20.4	6.9	4.8	2.7
Pontiac Firebird	6	231 cu. in.	10,397	19.7	6.3		
	8	301/305 cu. in.	36,495	20.1	8.0	5.7	3.5
	8	350 cu. in.	12,090	18.2	7.5		
	8	400/403 cu. in.	51,969	19.0	7.5	5.0	3.3

NOTES:

- Minimum exposure requirements for reporting:

All Claims 5,000 vehicle years
 Claims >\$250 10,000 vehicle years
 Claims >\$500 15,000 vehicle years
 Claims >\$1,000 25,000 vehicle years

- All results are standardized (see Appendix B).

TABLE 2
PERSONAL INJURY PROTECTION COVERAGES
CLAIM FREQUENCY RESULTS BY ENGINE OPTION
SELECTED 1977-1979 COMPACT TWO- AND FOUR-DOOR MODELS

Make and Series	Engine Option		Exposure (Insured Vehicle Years)	Claim Frequencies by Size of Claim (per 1,000 Insured Vehicle Years)		
	No. of Cylinders	Displacement		All	> \$250	> \$500
Ford Granada (2-door)	6	250 cu. in.	56,327	18.9	7.7	5.1
	8	302 cu. in.	46,640	18.1	6.9	4.7
Ford Granada (4-door)	6	250 cu. in.	55,849	17.4	6.5	4.2
	8	302 cu. in.	48,497	15.8	6.3	4.2
Ford Fairmont (2-door)	4	2.3 litre	14,779	18.7	7.0	
	6	200 cu. in.	47,372	21.6	8.4	3.4
	8	302 cu. in.	9,848	22.5		
Ford Fairmont (4-door)	4	2.3 litre	8,386	19.3		3.0
	6	200 cu. in.	30,982	18.0	7.2	4.5
Chevrolet Malibu (2-door)	6	200 cu. in.	22,590	17.9	5.8	3.9
	8	267 cu. in.	8,601	16.1		3.6
	8	305 cu. in.	20,402	17.4	6.0	
Chevrolet Malibu (4-door)	6	200 cu. in.	23,737	16.3	5.7	3.5
	8	267 cu. in.	9,153	13.4		4.2
	8	305 cu. in.	18,269	16.2	6.0	
Oldsmobile Cutlass (2-door)	6	231 cu. in.	32,190	17.8	6.6	4.1
	8	267 cu. in.	124,067	16.6	6.7	4.5
	8	305 cu. in.	29,037	15.2	5.8	3.9
Plymouth Volare (2-door)	6	225 cu. in.	43,021	18.1	6.0	4.2
	8	318 cu. in.	10,032	16.7	6.0	
Plymouth Volare (4-door)	6	225 cu. in.	51,469	15.9	5.7	3.6
	8	318 cu. in.	11,526	14.7	5.4	

NOTES:

- Minimum exposure requirements for reporting: All Claims 5,000 vehicle years
Claims > \$250 10,000 vehicle years
- All results are standardized (see Appendix B).
- Claims > \$500 15,000 vehicle years
Claims > \$1,000 25,000 vehicle years

TABLE 3
COLLISION COVERAGES
LOSS PAYMENT RESULTS BY ENGINE OPTION
SELECTED 1978 COMPACT SPECIALTY MODELS

Make and Series	No. of Cylinders	Engine Option Displacement	Exposure (Insured Vehicle Years)	Claim Frequency per 100 Insured Vehicle Years	Average Loss Payment per Claim	Average Loss Payment per Insured Vehicle Year
Chevrolet Monte Carlo	6	200 cu. in.	3,945	10.6	\$ 983	\$104
	6	231 cu. in.	38,543	10.5	999	105
	8	305 cu. in.	169,148	10.8	1040	112
Chevrolet Camaro	6	250 cu. in.	24,884	13.0	840	109
	8	305 cu. in.	84,766	12.5	898	112
	8	350 cu. in.	49,878	13.4	1123	150
Pontiac Firebird	6	231 cu. in.	8,407	11.8	850	100
	8	301/305 cu. in.	30,456	12.6	1006	127
	8	350 cu. in.	11,635	13.0	1033	134
	8	400/403 cu. in.	51,883	15.0	1268	190

NOTES:

- Results are standardized (see Appendix B).

TABLE 4
COLLISION COVERAGES
LOSS PAYMENT RESULTS BY ENGINE OPTION
SELECTED 1979 COMPACT SPECIALTY MODELS

Make and Series	No. of Cylinders	Engine Option — Displacement	Exposure (Insured Vehicle Years)	Claim Frequency per 100 Insured Vehicle Years	Average Loss Payment per Claim	Average Loss Payment per Insured Vehicle Year
Chevrolet Monte Carlo	6	200 cu. in.	8,609	10.8	\$1043	\$113
	6	231 cu. in.	18,546	9.5	1013	96
	8	267 cu. in.	50,467	10.0	1064	106
	8	305 cu. in.	42,202	10.1	1129	114
Chevrolet Camaro	6	250 cu. in.	9,990	12.7	867	110
	8	305 cu. in.	49,619	12.3	959	118
	8	350 cu. in.	45,534	13.8	1226	169
Pontiac Firebird	6	231 cu. in.	5,326	12.0	966	116
	8	301/305 cu. in.	30,430	12.4	1140	141
	8	400/403 cu. in.	42,909	13.6	1427	194

NOTES:

- Results are standardized (see Appendix B).

TABLE 5
COLLISION COVERAGES
LOSS PAYMENT RESULTS BY ENGINE OPTION
SELECTED 1978 COMPACT TWO- AND FOUR-DOOR MODELS

Make and Series	No. of Cylinders	Engine Option — Displacement	Exposure (Insured Vehicle Years)	Claim Frequency per 100 Insured Vehicle Years	Average Loss Payment per Claim	Average Loss Payment per Insured Vehicle Year
Ford Granada (2-door)	6	250 cu. in.	48,692	9.5	\$ 952	\$ 90
	8	302 cu. in.	22,414	8.8	948	83
Ford Granada (4-door)	6	250 cu. in.	48,974	8.5	973	83
	8	302 cu. in.	27,502	8.1	956	77
Ford Fairmont (2-door)	4	2.3 litre	17,647	8.6	940	81
	6	200 cu. in.	83,562	9.0	1021	92
	8	302 cu. in.	25,380	9.5	1085	103
Ford Fairmont (4-door)	4	2.3 litre	9,035	8.5	930	79
	6	200 cu. in.	54,313	8.2	982	81
Chevrolet Malibu (2-door)	6	200 cu. in.	30,812	8.6	914	79
	8	305 cu. in.	45,648	8.7	952	83
Chevrolet Malibu (4-door)	6	200 cu. in.	34,222	8.5	878	75
	8	305 cu. in.	41,038	8.0	922	74
Oldsmobile Cutlass (2-door)	6	231 cu. in.	36,191	9.3	944	88
	8	260 cu. in.	214,276	9.9	983	97
	8	305 cu. in.	45,593	10.0	1062	106
Plymouth Volare (2-door)	6	225 cu. in.	29,378	8.1	897	73
	8	318 cu. in.	6,417	8.8	1059	93
Plymouth Volare (4-door)	6	225 cu. in.	33,213	7.3	879	64
	8	318 cu. in.	6,291	6.7	814	55

NOTES:

- Results are standardized (see Appendix B).

TABLE 6
COLLISION COVERAGES
LOSS PAYMENT RESULTS BY ENGINE OPTION
SELECTED 1979 COMPACT TWO- AND FOUR-DOOR MODELS

Make and Series	No. of Cylinders	Engine Option — Displacement	Exposure (Insured Vehicle Years)	Claim Frequency per 100 Insured Vehicle Years	Average Loss Payment per Claim	Average Loss Payment per Insured Vehicle Year
Ford Granada (2-door)	6	250 cu. in.	25,312	8.6	\$1037	\$ 89
	8	302 cu. in.	4,461	8.7	1024	89
Ford Granada (4-door)	6	250 cu. in.	27,263	8.0	1009	81
	8	302 cu. in.	5,525	8.1	1083	88
Ford Fairmont (2-door)	4	2.3 litre	21,368	9.2	1022	94
	6	200 cu. in.	38,345	8.9	1068	95
	8	302 cu. in.	4,911	8.9	1185	105
Ford Fairmont (4-door)	4	2.3 litre	11,667	8.4	1043	88
	6	200 cu. in.	24,375	7.9	979	77
Chevrolet Malibu (2-door)	6	200 cu. in.	19,739	8.4	978	82
	8	267 cu. in.	20,414	8.2	1103	90
	8	305 cu. in.	10,502	8.5	1102	94
Chevrolet Malibu (4-door)	6	200 cu. in.	18,593	7.7	892	69
	8	267 cu. in.	20,036	7.9	918	73
	8	305 cu. in.	8,149	7.4	990	73
Oldsmobile Cutlass (2-door)	6	231 cu. in.	45,446	9.3	978	91
	8	260 cu. in.	125,656	9.4	1012	95
	8	305 cu. in.	36,655	9.4	1077	101
Plymouth Volare (2-door)	6	225 cu. in.	16,136	9.1	900	82
	8	318 cu. in.	1,951	9.6	1029	99
Plymouth Volare (4-door)	6	225 cu. in.	18,135	7.4	980	73
	8	318 cu. in.	1,773	7.1	894	63

NOTES:

- Results are standardized (see Appendix B).

Appendix A

Sources and Nature of Data

Sources and Nature of Data

This report is based on both policy and claim related coverage data for 1977 model year vehicles in the calendar period September 1976 through November 1980, for 1978 model year vehicles in the period September 1977 through November 1980, and 1979 model year vehicles in the calendar period September 1978 through November 1980. "Assigned risk", fleet policies, and all data from Massachusetts were excluded. The data used were supplied by ten insurers: Aetna, Allstate, GEICO, Kemper, Liberty Mutual, Nationwide, Prudential, State Farm, Travelers, and USAA.

The personal injury protection coverages reported in this study were based on data from the 20 states listed in Table A-1.

Table A-1
Personal Injury Protection (PIP) Coverages
States Included

Colorado	Minnesota
Connecticut	Nevada (through December 1979)
Delaware	New Jersey
Florida	New York
Georgia	North Dakota
Hawaii	Oregon
Kansas	Pennsylvania
Kentucky	South Carolina
Maryland	Texas
Michigan	Utah

Insurance Policy Data

Insurance policy data, as distinct from claim data, describe the characteristics of an insured vehicle, including its make and series and the nature of its collision coverage. Policy data used in this report included the following basic information:

- Vehicle Identification Number (VIN)*
- Deductible Amount*
- Rated Driver Characteristics*
- Date and Nature of Relevant Changes in Coverage

Insurance Claim Data

Insurance claim data report the characteristics of an insured vehicle for which a collision coverage claim is made, the initiation of the claim, and/or the corresponding payment. Claim data used in this report included the following basic information:

- Vehicle Identification Number (VIN)
- Crash Date
- Loss Payment Amount

The dollar amounts reported for collision coverage losses represented loss payments made to or on behalf of the policyholder for damage to the insured vehicle.

*See Appendix C for definitions.

Appendix B

Method of Data Analysis

Method of Data Analysis

Insurance Coverages

Results in this report are based on "personal injury protection" (PIP) and collision coverages. PIP coverages are provided in so-called no-fault states. These coverages were selected because they provide medical expense reimbursement to injured occupants of the insured vehicle.

Use of PIP insurance data to identify crashes involving injury has certain limitations because these data cannot provide information on all occupant injuries. This occurs when claims for injury costs are not made under PIP coverages because of the availability of other sources of medical expense reimbursements such as bodily injury liability and/or health insurance coverages. Consequently, PIP claim frequencies do not include all of the crashes involving injury. This limitation should not distort comparisons among different vehicles.

Vehicle Description and Identification

The Vehicle Identification Numbers (VINs) of most new automobiles sold in the United States are individually unique numbers that contain, in coded form, detailed information as to each vehicle's make, model year, series*, and other distinguishing characteristics.

The very specific vehicle types for which results are presented in this report were derived from the VINs of the individual automobiles.

Only data with valid VINs were used for this report. Each VIN was decoded into a set of specific characteristics. For the purposes of this report the vehicle characteristics of primary concern were make, model year, series, body style, engine type, and displacement.

Exposure

Exposure, in insured vehicle years, was computed for each individual vehicle from the coverage data. The total number of insured vehicle years for each vehicle series with each available engine was obtained by accumulating the exposure for all of the individual vehicles of that vehicle series.

Exposure was obtained for the vehicles series with each available engine within the series, for each of the four most common combinations of deductible amount and operator age group, a, b, c, d, shown below:

Deductible Amount	Youthful Operator*	No Youthful Operator*
<\$150	a	b
≥\$150	c	d

For PIP injury coverages, exposure was computed only for each operator age group -- youthful operators and no youthful operators.

*See Appendix C for definitions.

Claim Frequency

Both pending and paid claims for an individual vehicle were first matched with its corresponding coverage data to ensure that the crash had occurred within an appropriate period of injury or collision coverage for that vehicle. In every instance in which multiple claims were made for the same crash — e.g., when more than one occupant of the car incurred medical expenses — the claims were treated as a single injury claim in the calculation of claim frequencies. It should be noted that medical expenses can sometimes be incurred even though the occupants are not injured. This can occur, for example, when precautionary medical examinations are undertaken even though no injuries are apparent, or, in fact, found.

Claims that were settled without payment, as well as those paid for collision losses even though the damage was less than the deductible amount, were excluded for the computations. All remaining claims for each vehicle series, together with the corresponding exposure, were used to compute the claim frequency. Claim frequencies were separately calculated for the vehicles with each available engine option within each series. For injury coverages the claim frequency is the number of claims per 1,000 insured vehicle years; for collision coverages, it is the number of claims per 100 insured vehicle years.

In addition to the overall claim frequency results, separate claim frequency results were computed for claims in which the medical losses exceeded \$250, \$500, and \$1,000. The latter three results provide indications of the extent to which particular cars are over- or under-involved in crashes resulting in more significant injuries. Claims involving non-medical losses only and claims settled without payments were not used. Thus, the claim frequencies represent the number of crashes per 1,000 insured vehicle years in which one or more injuries occurred resulting in medical expense claim payments under PIP insurance coverages.

Average Loss Payment

For collision coverages, average loss payments per claim were calculated for each vehicle series and available engine option. The paid claims were summed and divided by the number of claims to produce the average loss payment per claim. Claims that were settled without payment, as well as those paid even though the damage was less than the deductible amount, were excluded from the computations. In every instance in which multiple claims and/or multiple payments were made for the same crash, they were treated as a single claim and/or a single payment in the calculation of average loss payment.

Average loss payments were also obtained for each combination of the two principal deductible amounts and the two operator age groups.

Average Loss Payment Per Insured Vehicle Year

For collision coverages the average loss payment per insured vehicle year for each vehicle series and available engine option within the series was obtained by multiplying each respective claim frequency per 100 insured vehicle years by its corresponding average loss payment and dividing the result by 100.

Average loss payments per insured vehicle year were also obtained for each combination of deductible amount and operator age group.

Standardization

It is well known that loss experience can vary substantially in relation to certain non-vehicle factors. One important factor that influences loss experience is operator age. Youthful operators generally generate higher insurance losses than older drivers. Thus, if compared vehicles have different proportions of youthful operators, this difference, if not taken into consideration, would be sufficient to bias the comparison.

In order to remove any biases that could result because of variations among different vehicles in operator age group, the PIP injury coverage results for each vehicle series and available engine option were weighted, using the values shown below, to produce a weighted average of the actual results for each operator age group. In this way the results for each vehicle series are based on the same mix, or distribution, of exposure for the two operator age groups.

Since the same weights are used for each vehicle series, the effects due to operator age group are present in equal amounts in the standardized results for each individual series. Therefore, to the extent that the age distributions within operator age group do not vary substantially for different vehicles, these effects can no longer bias comparisons among vehicles.

For collision coverages, results obtained from the two deductible categories, less than \$150 and greater than or equal to \$150, also vary. For example, average loss payments for the higher deductibles are greater than those for the lower deductibles. Again, if compared vehicles have different proportions of lower deductible coverages, this difference, if not taken into consideration, would also be sufficient to bias the comparison.

Consequently, in order to remove any biases in the comparison of results that could arise because of differences attributable to variations among different vehicles in deductible amount and operator age group, collision loss results were first adjusted or standardized so as to equalize the effects of the two non-vehicle factors in the standardized results. In this procedure, applied to both claim frequency and average loss payments, a weighted average of the actual results for each combination of deductible amount and operator age group was computed using the standardization weights shown in the table. Since the same weights were always used, the effects due to the non-vehicle factors were present in equal amounts in the standardized results. Therefore, to the extent that the age distributions within each operator age group and the deductible distributions within each deductible group do not vary substantially for different vehicles, these effects can no longer bias comparisons of results.

The standardization procedure employed is widely used in vital health statistics*. The basic principle of the method is the introduction of a selected population with a standard distribution across the combinations of deductible amount and operator age group as represented by the standardization weights in the table.

Injury Standardization Weights

Youthful Operator	No Youthful Operator	Combined
0.15	0.85	1.0

Collision Standardization Weights

Deductible Amount	-----Operator Age Group-----		
	Youthful Operator	No Youthful Operator	Combined
<\$150	0.10	0.60	0.70
≥\$150	0.05	0.25	0.30
Combined	0.15	0.85	1.00

*For example, see Armitage, P. (1971), *Statistical Methods in Medical Research*, Wiley, New York.

Appendix C

Definitions

Definitions

Average Loss Payment per Claim – The total of all collision loss payments made for the claims for a group of vehicles, divided by the number of claims paid; expressed as dollars per claim.

Average Loss Payment per Insured Vehicle Year – For a group of vehicles, the product of Claim Frequency and Average Loss Payment per Claim, divided by 100; expressed as dollars per insured vehicle year. It should be noted that this definition differs from the commonly used insurance term, pure premium, but yields similar results.

Claim Frequency – The number of claims for a group of vehicles, divided by the exposure for that group; expressed as claims per one hundred insured vehicle years for collision coverages, and as claims per one thousand insured vehicle years for PIP coverages.

Collision Coverages – As defined in insurance contracts, the coverage under which people insure their own car against loss caused by collision.

Deductible Amount – That portion of the collision damage cost borne by the policyholder. For computing results, deductible amounts are split into two groups: less than \$150 (mainly \$50 and \$100 deductibles) and greater than or equal to \$150 (mainly \$200 and \$250 deductibles).

Exposure – The time interval an individual vehicle is insured. Exposure for a group of vehicles is expressed in units of insured vehicle years.

First-Party Coverage – An insurance coverage under which the policyholder collects compensation for his losses from his own insurer regardless of fault.

Loss Payment – That portion of the collision damage cost borne by the insurer; in general, the total collision damage cost minus the deductible amount.

No-Fault Auto Insurance – An auto insurance plan in which each driver/owner accepts financial responsibility for some or all losses sustained by himself, pedestrians hit by him, and occupants of his own vehicle in return for which he enjoys some immunity from liability for losses to third-party persons.

Operator Age Group – The factor which distinguishes those vehicles whose rated driver is youthful from those vehicles whose rated driver is not youthful (see Youthful Operator).

Personal Injury Protection (PIP) Coverage – First-party no-fault coverage in which an insurer pays, within the specified limits, the medical, hospital, and other expenses of the insured, others in his vehicle, and pedestrians struck by him.

Rated Driver – The driver who, for insurance purposes, is considered to represent the greatest loss potential for the insured automobile.

Vehicle Identification Number (VIN) – A code, variously comprising both numbers and letters; normally 8 to 15 characters in length, assigned to each automobile by its manufacturer. The VIN uniquely identifies the vehicle within at least a ten-year time span, and, in recent model year vehicles, almost always contains coding which identifies the make, series, model year, and other characteristics of each vehicle.

Vehicle Series – A name denoting a family of vehicles, within a make, with the same wheelbase and a degree of commonality in construction such as body, chassis, etc.

Vehicle Size Group – A grouping of vehicles based on wheelbase. There are six car size classes defined as follows:

Small Subcompact – Vehicles with wheelbases less than or equal to 96 inches.

Subcompact – Vehicles with wheelbases greater than 96 inches and less than or equal to 101 inches.

Small Compact – Vehicles with wheelbases greater than 101 inches and less than or equal to 106 inches.

Compact – Vehicles with wheelbases greater than 106 inches and less than or equal to 111 inches.

Intermediate – Vehicles with wheelbases greater than 111 inches and less than or equal to 120 inches.

Full-Size – Vehicles with wheelbases greater than 120 inches.

Each vehicle size group is further divided into four subgroups – regular two-door models, regular four-door models, station wagons, and sports or specialty models. In the compact, intermediate, and full-size groups, the specialty models are those that either have only two-door models or are luxury cars. The sports subgroup in the two subcompact size classes are sports models which are basically two-seater cars.

Youthful Operator – For the purposes of this report, all males (married or single) under 25 years of age and all unmarried females under 25 years of age.

List of Publications

Other research reports published by the Highway Loss Data Institute are:

- R72-1 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1972 Models, June 1973.*
- R73-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1973 Models Compared with 1972 Models, September 1973.*
- R73-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models, March 1974.*
- R73-3 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models During Their First Two Years, December 1974.*
- R73-4 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models During Their First Three Years, December 1975.*
- R74-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1974 Models, May 1974.*
- R74-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1974 Models During Their First Year, December 1974.*
- R74-3 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1974 Models During Their First Two Years, December 1975.*
- R75-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1975 Models, July 1975.*
- R75-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1975 Models During Their First Year, December 1975.*
- R76-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1976 Models, June 1976.*
- R76-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1976 Models During Their First Year, 1975 Models During Their First Two Years, 1974 Models During Their First Three Years, December 1976.*
- R77-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1977 Models, June 1977.*
- R77-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1977 Models During Their First Year, 1976 Models During Their First Two Years, 1975 Models During Their First Three Years, December 1977.*
- R78-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1978 Models, June 1978.*
- R78-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1978 Models During Their First Year, 1977 Models During Their First Two Years, 1976 Models During Their First Three Years, January 1979.*
- R79-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1979 Models, June 1979.*

- R79-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1979 Models During Their First Year, 1978 Models During Their First Two Years, 1977 Models During Their First Three Years, December 1979.*
- R80-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1980 Models, June 1980.*
- R80-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1980 Models During Their First Year, 1979 Models During Their First Two Years, 1978 Models During Their First Three Years, December 1980.*
- V78-1 *Automobile Insurance Losses, Non-Commercial Collision Coverages; Variations by Make and Series, Vans, Pickups and Utility Vehicles, 1978 Models During Their First Year, 1977 Models During Their First Two Years, February 1979.*
- V79-1 *Automobile Insurance Losses, Non-Commercial Collision Coverages; Variations by Make and Series, Vans, Pickups and Utility Vehicles, 1979 Models During Their First Year, 1978 Models During Their First Two Years, April 1980.*
- V79-2 *Automobile Insurance Losses, Personal Injury Protection Coverages; Claim Frequency Results by Size of Claim for 1977, 1978, and 1979 Vans, Pickup Trucks, and Utility Vehicles, October 1980.*
- V79-3 *Insurance Theft Losses; Vans, Pickups, and Utility Vehicles, 1979 Models. May 1981.**
- V80-1 *Automobile Insurance Losses, Non-Commercial Collision Coverages; Variations by Make and Series, Vans, Pickups, and Utility Vehicles, 1980 Models During Their First Year, 1979 Models During Their First Two Years, 1978 Models During Their First Three Years, December 1980.*
- I 75-1 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1974 and 1975 Models, June 1976.*
- I 75-2 *Automobile Insurance Losses, Percentage of Collision Claims with Associated Injury Claims for 1974 and 1975 Models, March 1977.*
- I 76-1 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1974, 1975, and 1976 Models, November 1977.*
- I 76-2 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1974, 1975, and 1976 Models, September 1978.*
- I 77-1 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1977 Models, September 1978.*
- I 78-1 *Automobile Insurance Losses, Personal Injury Protection Coverages; Claim Frequency Results for 1977 and 1978 Models, September 1979.*
- I 79-1 *Automobile Insurance Losses, Personal Injury Protection Coverages; Claim Frequency Results by Size of Claim for 1977, 1978, and 1979 Models, October 1980.*

- A-1 *Automobile Insurance Losses, Collision Coverages; A Comparison of Results for 1972 and 1973 Models, May 1974.*
- A-2 *Automobile Insurance Losses, Collision Coverages; Relationships Between Losses and Vehicle Density, 1972 and 1973 Models, September 1974.*
- A-3 *Automobile Insurance Losses, Collision Coverages; A Comparison of Results for 1973, 1974 and 1975 Models, July 1975.*
- A-4 *Automobile Insurance Losses, Collision Coverages; Relationships Between Losses and Vehicle Density, 1974 and 1975 Models, December 1975.*
- A-5 *Automobile Insurance Losses, Collision Coverages; Relationships Between Losses and Vehicle Body Style, 1974 and 1975 Models, December 1975.*
- A-6 *Automobile Insurance Losses, Collision Coverages; An Investigation of Relationships Between Losses and Engine Specifications, Using 1973 Models, June 1976.*
- A-7 *Automobile Insurance Losses, Collision Coverages; Annual Increases and Seasonal Variations, 1972, 1973, 1974 and 1975 Models, June 1976.*
- A-8 *Automobile Insurance Losses, Injury Coverages; A Preliminary Comparison of Results from Volkswagen Rabbits with Passive and Active Seat Belts, 1975 and 1976 Models, June 1977.*
- A-9 *Automobile Insurance Losses, Collision Coverages; A Comparison of Collision Claim Size Distributions for 1974, 1975, and 1976 Models, November 1977.*
- A-10 *Automobile Insurance Losses, Injury Coverages; Comparisons of Claim Frequencies of Volkswagen Rabbits with Automatic and Manual Seat Belts, 1975, 1976, and 1977 Models, June 1979.*
- A-11 *Automobile Insurance Losses, Collision Coverages; The Consistency of the Loss Experience of Specific Vehicles Produced in Several Years, 1975 To 1978 Models, June 1979.*
- A-12 *Automobile Insurance Losses, Collision Coverages; An Assessment of the Effects of the Federal Safety Bumper Standard on the Losses for 1972 Through 1978 Models, June 1980.*
- A-13 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; The Effects of Car Size on Crash Losses, 1977-1980 Models, May 1981.*
- A-14 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; Comparisons of the Loss Experience of Two- and Four-Door Cars, 1978, 1979, and 1980 Models, June 1981.*
- T79-1 *Automobile Insurance Theft Losses by Make and Series, 1979 Models, June 1980.*
- T80-1 *Automobile Insurance Theft Losses by Make and Series; 1979 and 1980 Models. April 1981.*